Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

CC DOCKET 98-147(FCC 98-188)

COMMENTS OF NEW WORLD PARADIGM, LTD.

# SUMMARY

Making the incumbent's xDSL technology accessible to competitive LECs requires systematic assessment of each loop's ability to deliver xDSL services. That assessment will be slow and costly because many things affect xDSL service. Many loops are over 40 years old and an individual line from a central office to a subscriber is spliced together an average of 22 times. Erroneous records and non-obvious technical barriers will slow the compatibility assessment process and make it far more costly than an incidental or *de minimus* expense. Local telephone ratepayers, not the incumbent's affiliate or the CLEC, will pay the costs of determining if a loop is xDSL compatible. Loop spectrum management, where an incumbent and a CLEC share the same loop, will be difficult unless the voice signal is constrained so that it's out-of-band spectrum and spurious signal creation is limited by standards guaranteeing that no significant energy leaks from the voice spectrum to the data spectrum. The telephone industry's outside copper plant is a gigantic antenna field that receives and radiates energy every instant. Loop spectrum can not be well managed until twisted pairs' antenna effects are constrained to comply with Part 15 of Title 47 of the U.S. Code.

COMMENTS ON CC DOCKET 98-147(FCC 98-188):
NEW WORLD PARADIGM, LTD.

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NEW WORLD PARADIGM, LTD.

1. *Introduction*

New World Paradigm, Ltd. is a research firm specializing in the development of communications and video technologies. NWP directs its comments to the local loop requirements discussed in the NPRM where several loop issues are treated as if they were independent, stand-alone items.

2. *Methods To Determine If Loops Are xDSL Compatible*

Regarding the suitability of loops for various xDSL services, Par. 157 states:

> We tentatively conclude that incumbent LECs should provide requesting competitive LECs with sufficient detailed information about the loop so that competitive LECs can make an independent determination about whether the loop is capable of supporting the xDSL equipment they intend to install....We tentatively conclude that it is important that competitors have the ability to make their own assessments because the parameters for determining whether a loop is xDSL- compatible may differ for different technologies. Such parameters may also change as technology evolves.

Count on the parameters changing because new electronics and the use of more complex coding and modulation will always present newer and better ways to send an xDSL signal down a loop, thus preventing the establishment of standardized signal

propagation for xDSL. Therefore, DSL compatibility cannot be determined *a priori* because it is a function of many interrelated issues. The compatibility issue raised in Par. 157 can not be divorced from the spectrum management issues raised in Par. 160:

> We ask commenters to address any interference that may result from provision of advanced telecommunications capability using different signal formats on copper pairs in the same bundle

Interference is a compatibility issue, but the NPRM neither refers to nor discusses the methods, procedures or analysis that enable an incumbent LEC to determine if a given loop is xDSL compatible. Without such reference, the conclusions in Par. 157 fall to the level of "wishful thinking" because they can be acted on only by assuming that xDSL compatibility is the principle guiding the incumbents' gathering and maintenance of loop information. This assumption is not supported by the questions in Par. 158:

> Do incumbent LECs currently have a detailed inventory of existing loops? Do incumbent LECs currently have electronic access to such information?

These questions suggest that systematic knowledge about loops and their xDSL compatibility is hard to get, an impression supported by the hesitant, unsure quality of Footnote 299 :

> Various manufacturers and research and development firms are improving upon and developing new varieties of xDSL technology. Furthermore, these firms <u>may</u> [emphasis added by NWP] develop new methods to determine whether, and to what extent, loops are xDSL-compatible.

"May develop new methods" begs the question: what methods are being used today? We examined the URLs cited in footnote 299 and found no explicit or implicit discussions of today's methods or the future's. Without a solid understanding of the current procedures used "to determine whether, and to what extent, loops are xDSL-compatible," the CLECs will not be able to tell if the "compatibility" information they receive is reliable even if the same information is handed to the incumbent's subsidiary. The uncertainty is not necessarily caused by an incumbent's effort to deny access to xDSL technology. The more likely causes are erroneous records and non-obvious technical barriers .

Considering that many loops are over 40 years old,[1] imperfect records will be a problem. Some errors can be compensated for if the records are internally inconsistent. For example, an obvious barrier to xDSL compatibility is a loading coil. A loop record showing a length greater than 18,000 feet but no coils suggests a record keeping error that can be corrected by field data. Of course, if loading coils are removed they have to be replaced by line amplifiers to maintain the loop's voice quality, a labor and material cost that should be factored into xDSL installation cost.

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[1] See "ADSL: Turning Copper into Gold," at http://www/rohr.com/intelligence/papers/adsl2.html

Unfortunately, internal inconsistency can't be used to detect record keeping errors for a bridge tap, another obvious barrier to xDSL compatibility. If the record indicates no bridge tap, there is no reason to suspect its presence on a loop until xDSL service fails. Furthermore, the presence of a bridge tap is not necessarily correlated with the presence of a loading coil, thus potentially raising costs because both problems can not be handled in a single field trip. Even when loading coils and bridge taps are accounted for, non-obvious technical problems will make a loop incompatible or poorly compatible with xDSL technology. According to one source:

> Bellcore claims that an individual line from a CO to a subscriber is spliced together an average of 22 times... spliced wires do not filter out noise as well as unspliced wires.[2]

Noise problems and poor signal quality are likely because a loop's transmission properties for xDSL service vary according to the number of splices, kinks in the line, temperature and moisture. An ADSL loop that works in the daytime may not work at night, and a loop that worked last week may not work next week. A typical troubleshooting procedure is to send out linemen with time domain reflectometers to locate the kink in the line or the break in the insulator which lets the moisture in and so on, all the while raising DSL's costs. In short, the method used today to determine if a loop is xDSL compatible is labor intensive and reactive instead of proactive. Today's

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[2] Id.

method is time-consuming, on-going and far more costly than an incidental or *de minimus* expense.

3. *Local Telephone Ratepayers Will Pay The Costs Of Determining If A Loop is xDSL Compatible*

Unfortunately, the NPRM fails to address the issue of who pays for determining a loop's xDSL compatibility. The omission is an open invitation to bill the costs to local telephone ratepayers. The NPRM discusses costs and telephone ratepayers only in Par. 96, which speaks to the danger of improper cost allocations by the incumbent's advanced service affiliate. However, the discussions in Par. 157 and Par. 158 clearly say that it is the incumbent LEC that determines compatibility, not the affiliate. Furthermore, the NPRM has no proposal suggesting that the incumbent charge the costs to its affiliate or to the competitive LEC. The incumbent's affiliate has no reason to burden itself with such costs. Likewise for the competitive LEC. The local telephone ratepayer appears to be the payer of last resort.

Because the local loop is involved, the costs will be recovered in state jurisdictions. Although many states employ pricecaps to regulate incumbents, they often have flexibility to adjust local prices for inflation and federally imposed costs. Determining a loop's compatibility with xDSL technology is surely a federally imposed

cost that will passed on to ratepayers, unless the Commission reverses its tentative conclusions in Pars. 157 and 158.

4. *Loop Spectrum Management Will Be Difficult Because DSL Is An Incomplete Product*

DSL is an unfinished product whose performance has yet to be measured and whose costs remain unknown, as suggested by the NPRM's tentative conclusion at Par. 158:

> We also tentatively conclude that, as new information becomes available, incumbent LECs should be required to share such information with new entrants immediately.

DSL's incomplete and "at loose-ends" nature is again raised by the NPRM's question at Par. 162:

> A competitive LEC may want to provide only high-speed data service, without voice service, over an unbundled loop. Should the competitive LEC have the right to put a high frequency signal on the same loop as the incumbent LEC's voice signal?

Competitive LECs should have that right, but they offer such service at their own risk until the incumbent's voice signal is constrained so that it's out-of-band spectrum and spurious signal creation is limited by standards guaranteeing that no significant energy leaks from the voice spectrum to the CLEC's spectrum. There are no such standards

today, and they are not imminent. This issue should be settled before addressing the question of who handles the frequency multiplexing equipment. A more important question may be about safety planning. BellCore's lightning protection performance specifications, which protect the central office and the distribution network, do not explicitly consider DSL interfaces. Their resistance to lightning and powercross problems has yet to be proven, another sign of an incomplete product.

More information about DSL technology is certainly needed. No studies have been cited showing how ADSL, HDSL, RDSL and VDSL interact in the same multipair cable. Interference and signal degradation should be expected if various xDSL services occupy a high proportion of twisted pairs in a multipair cable. Adjacent multipair cables can also interfere with each other, if they both carry a substantial number of xDSL loops. Until these problems are clarified and solved loop spectrum management will be well-nigh impossible.

5. *Loop Spectrum Can Not Be Well Managed Until Twisted Pairs' Antenna Effects Are Accounted For*

The NPRM's discussion of xDSL omits a crucial technical point that bears on the loop and radio spectrum: The telephone industry's outside copper plant is a gigantic

antenna field that receives and radiates energy every instant. Twisted pairs are long line antennas that both emit and pick up energy, just like rabbit ears or a wire coat hanger on an old TV set, or a wire strung across a roof. For years twisted pairs have been receiving and emitting radio signals without substantial interference between telephone voice service and commercial radio service. There has been no substantial interference because telephone voice services and commercial radio operate in different spectrum. This situation changes with the advent of xDSL service because ADSL occupies the frequency range up to 1.1 MHz and overlaps a sizeable portion of the radiated spectrum devoted to AM radio, 550 KHz to 1.45 MHz.

There is no doubt that high powered AM stations operating in the spectrum overlap will cause interference in ADSL lines. Said another way -- AM broadcast wavelengths coexist on the twisted pair and add significant amounts of corrupting energy to the DSL signal, degrading it and the service being delivered -- all across the country. Discrete Multitone line coding , the basis of ADSL signaling, does not compensate because DMT is being modulated up to 4KHz, which is the exact same frequency range for the modulation of AM broadcast signals. The AM signals will be picked up by the twisted pair, mix with and corrupt the DMT signal to the point where much of the DSL created bandwidth is lost.

On the other hand, because DSL hugely increases the energy being radiated from the outside telephone plant as well as the twisted pair, it will emit a RF energy many times stronger than what is emitted by voice service. A multipair cable heavily loaded with xDSL will create a radiated field that interferes with nearby AM broadcast reception. But AM reception may not be the only casualty. No one has shown that the huge increase of energy flowing through the copper plant will not violate the FCC's Part 15 regulations governing RF emmissions of non-licensed radio frequency devices. If Part 15's regulations are not enforced for xDSL service, its widespread deployment will cause significant electromagnetic pollution problems throughout the country and reduce the quality of service provided by many consumer products.

*6. National Standards For Loop Spectrum Management*

The problems we have described pervade the embedded local infrastructure, making loop spectrum management very difficult even in the best situations. At Par. 160 the NPRM says:

> We seek comment on whether the Commission should adopt any industry standards as the basis for national spectrum management requirements. We also seek comment on how any requirements should evolve over time so as to encourage and not stifle innovation.

Whether the Commission adopts the ANSI standards or something else, the inherent limitation of the embedded loop can not be overcome, as already indicated by the

ANSI T1 Committee's selection of Discrete Multitone for ADSL line coding. The Committee dismissed CAP[3] and QAM[4] methods because they were judged too weak to withstand the loop's vagaries. QAM is well regarded by cable operators, and they plan on using it to meet their simulcast obligations.[5] Of the 3 methods, DMT has the least ability to handle high speed data. It was chosen because it has a better chance of standing up to impulse noise, dispersion effects, and phase and amplitude ambiguities. The selection of the DMT standard was originally a choice between half-a-loaf and none at all. The loaf is reduced even further by the additional problems caused by the spectrum overlap with AM radio.

Based on our review of the NPRM and the ANSI T1 committee's choice of DMT to contain but not solve the loop's interference problems, we believe the adoption of national standards to manage loop spectrum will mask the copper loop's deficiencies. A national standard would give false hope to lawmakers and policymakers that "ordinary citizens can access ... networks at high speeds using existing copper wires, [for] a variety of new services and vast improvements to existing services ..."[6] High speed access will

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[3] Carrierless Amplitude Phase Modulation

[4] Quadrature Amplitude Phase Modulation

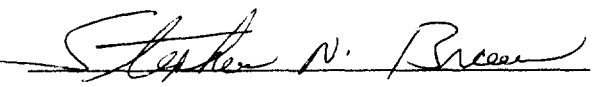
[5] See CS Docket 98-120(FCC Docket 98-153)

[6] NPRM Par. 7

always be spotty and intermittent because the copper network is hobbled by interference, incompatibilities and hidden expenses. Because this situation can't be changed by national standards, we recommend against their adoption.

Respectfully Submitted,

New World Paradigm, Ltd.

By: 

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